Idaho State Department of Agriculture
Division of Agricultural Resources

Ground Water Quality of Twin Falls County Volcanic and Sedimentary Aquifer 1998-2008

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ISDA Technical Results Summary #43 May 2009

Introduction

The Idaho State Department of Agriculture (ISDA) developed the Regional Agricultural Ground Water Quality Monitoring Program to characterize degradation of ground water quality from contaminants leaching from agricultural sources. The ISDA currently is conducting monitoring at 11 regions in Idaho with plans to implement further testing in other areas (Figure 1). The objectives of the program are to (1) characterize ground water quality related to primarily nitrate and pesticides, (2) determine if legal pesticide use contributes to aquifer degradation, (3) relate data to agricultural land use practices, and (4) provide data to support Best Management Practices (BMP) and/or regulatory decision making and evaluation processes.

The ISDA Twin Falls County Volcanic and Sedimentary Aquifer regional monitoring project began in 1998 as a result of previous monitoring by the Idaho Department of Water Resources (IDWR). Five wells in Twin Falls County tested during the first round of IDWR's Statewide Ambient Ground Water Quality Monitoring Program, exceeded the Environmental Protection Agency Maximum Contaminant Level (MCL)[1] of 10 milligrams per liter (mg/L) for nitrate as nitrogen (NO_3-N) (Neely and Crockett, 1999).

To establish this regional monitoring project, the ISDA randomly selected 75 domestic wells in the northern Twin Falls County area and coordinated with homeowners to conduct ground water sampling.

NO_3-N, pesticides and common ions were evaluated during the 11 years (1998 through 2008) of ISDA's testing to determine impacts to ground water and to locate potential sources. Laboratory results indicate areas showing water quality degradation from NO_3-N and to a lesser extent, pesticides. In any given year in the 11-year time period, 14 to 32 wells were between 5 mg/L and the EPA MCL for drinking water of 10 mg/L for NO_3-N. In addition, low level detections

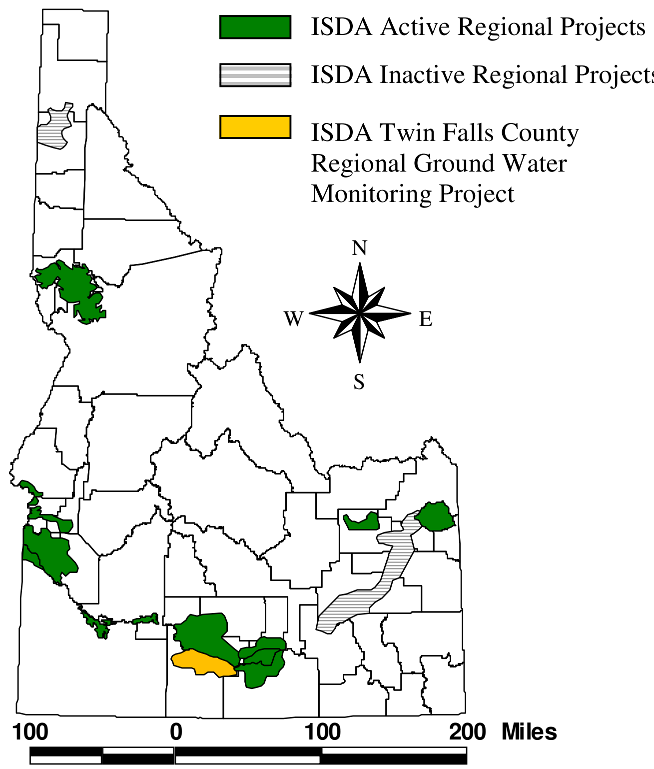

Figure 1. Location of Twin Falls County regional project and other regional project areas.

of various pesticides were found in several of the wells sampled throughout the study period.

The ISDA is working to advise residents and officials within the area on how to minimize further ground water contamination and possible human risks. Future ground water monitoring and education/outreach in this area is likely to continue. This area was recently designated as the number one Nitrate Priority Area (NPA) out of 32 NPAs in the State of Idaho by the Idaho Department of Environmental Quality (DEQ); with number one being the most contaminated and number 32 the least contaminated with nitrate. Refer to http://www.deq.state.id.us/water/prog_issues/ground_water/nitrate.cfm#ranking for the complete list of NPAs in Idaho.

[1]MCLs represent the EPA health standard for drinking water.

Methods

To establish this project, ISDA staff developed a project boundary based on known aquifer characteristics, land use information and data used to designate the area as a DEQ NPA. ISDA statistically determined that sampling 75 randomly selected domestic wells in the study area (wells shown in Figure 2) would provide adequate data to evaluate overall ground water quality underlying the area.

All sampling was conducted after a Quality Assurance Project Plan (QAPP) was established. Permission was gained from the homeowners prior to sampling.

Water samples were collected annually in the summer from 1998 through 2008. Nutrients and common ions were evaluated each year during this project. All sample collections followed established ISDA protocols for handling, storage, and shipping. Samples collected were sent to the University of Idaho Analytical Sciences Laboratory (UIASL) in Moscow, Idaho. The UIASL analyzed the ground water samples for NO_3-N, NO_2-N (nitrite), ammonia, ortho-phosphorous, chloride, sulfate, bromide, fluoride using EPA Methods 300.0 and 350.1. Pesticide samples were also collected in 1998, 1999, 2000, 2001, 2002, and 2006. The samples were sent to UIASL. UIASL used gas chromatography scans for pesticides using EPA Methods 507, 508, 515.2, and 632. Duplicates and blanks were collected and submitted as outlined in the QAPP.

Samples were collected from selected wells following ISDA protocols for nitrogen isotope analysis in 2001 through 2005 . The wells selected for nitrogen isotope analysis had elevated NO_3-N concentrations during the previous sampling event.

Description of Project Area

The Twin Falls County Volcanic and Sedimentary Aquifer regional project encompasses an approximately 25 mile wide and 40 mile long area of northern Twin Falls County south of the Snake River (Figures 1 and 2). The project area encompasses much of the agricultural land within Twin Falls County. The northern boundary of the project area is the Snake River. The project area is bound to the east by the county line and to the west by Salmon Falls Creek. The project area is bound to the south by the South Hills, the town of Hollister and Salmon Falls Creek.

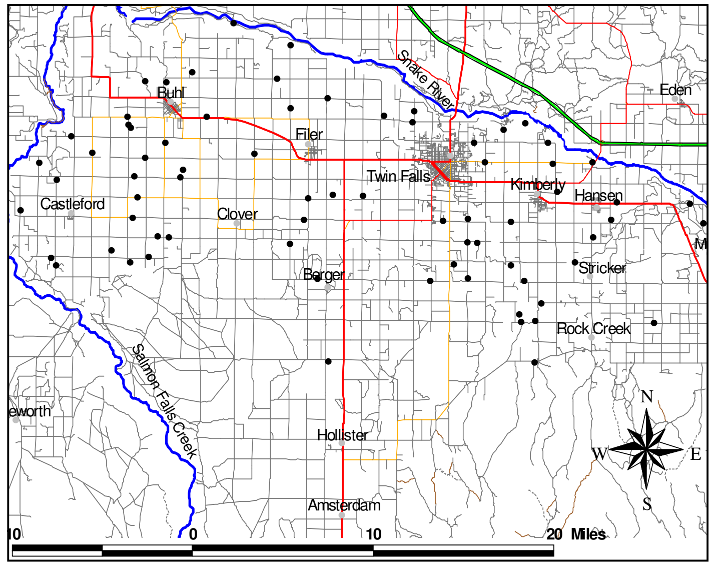

Figure 2. Location of original 75 wells within project area.

Climate

The climate is semi-arid with hot dry summers and moderately cold winters. Average total annual precipitation is higher in the eastern portion of the project area than in the western portion (Neely, 2001). The average annual precipitation for Buhl 2 (101220) station was 9.52 inches for the 1980-2007 period of record and 10.79 inches for Twin Falls WSO (109303) station for the 1963-2007 period of record. The average total snowfall recorded at the Buhl 2 and Twin Falls WSO stations was 0.7 inches and 26.2 inches, respectively, for the same period of records (Western Regional Climate Center, 2008).

Land Use

Major land uses in the project area are irrigated agriculture, residential, dairies and animal feeding operations (AFOs). Irrigated crop land, dairies and beef AFOs are the primary agricultural activities in the project area and make up most of the project area. Based on IDWR land use data in 2008, an estimated 80,000 acres are sprinkler irrigated while approximately 108,000 acres are flood irrigated. These numbers are based on visual identification through air photo analysis by IDWR staff.

Major crops in the area include alfalfa, barley, oats, wheat, beans, potatoes, sugarbeets, and corn (for grain and silage) (Idaho Agricultural Statistics Service, 2008).

Residential land use includes the cities and towns of Twin Falls, Buhl, Kimberly, Filer, Hansen and several other smaller communities.

Approximately 66 dairies currently are in operation within Twin Falls County with an approximate total of 99,500 animals (ISDA Bureau of Dairying, 2008).Twin Falls County currently has approximately 108 beef AFO facilities with a combined total capacity of approximately 90,300 animals (ISDA Bureau of Dairying, 2008).

Soils , Geology and Hydrogeology

The soils within the project area are predominately the Portneuf Silt Loam, Sluka Silt Loam, Minveno Silt Loam and Chiara Silt Loam soils. Also present are the following various "Silt Loam" soils including: Minidoka, Rad, Bahem, Gosinta, Roseworth; Chuska Gravelly Loam; and various rock outcrops (USGS, 2008).

The major geologic units within the project area are Pleistocene and Pliocene basalt lava and associated basaltic tuff (deposited close to a basaltic vent) and Pliocene and Upper Miocene basalt (including parts of the Starlight Formation and Salt Lake Formation) (Link, 2002).

Drillers' reports indicate that the ground water is primarily within fractured basaltic rocks with intercalated sands and gravels. The basalt and interbedded sediments are the primary aquifers in Twin Falls County (Neely and Crockett, 1999). Depth to water varies within the project area. Static water levels tend to be deeper in the central part compared to the rest of the project area (Neely, 2001). The variability in depth to water may be due to several factors including the wells being completed in different water-bearing zones. There are four primary water-bearing zones in Twin Falls County and they include: Idavada Volcanics Formation, Banbury Basalt Formation, Glenns Ferry Formation and the Snake River Group (Neely, 2001). Based on well drillers' reports from wells sampled as part of the project, depth to first encountered ground water ranges from about 10 feet to 300 feet below land surface.

Ground water flow direction in the project area is from the south to the north and northwest (Neely, 2001). Ground water recharge is primarily the result of infiltrating/percolating precipitation in the south and leaking canals and irrigation in the north.

Ground water vulnerability mapping has been done for the northern portion of the project area and was identified as having ground water vulnerability ratings ranging from moderate to very high (Neely, 2001). This implies that the aquifer is moderately to highly vulnerable to contamination which is likely due to the presence of exposed bedrock, which can be conducive to the leaching of contaminates, including pesticides.

Results

Sampling results from the past 11 years suggest NO_3-N and pesticide impacts have occurred within the Twin Falls regional ground water monitoring project area. The following sections provide a summary of NO_3-N, stable nitrogen isotope, and pesticide data.

Nitrate as Nitrogen (NO_3-N)

In 1998, ISDA sampled 75 wells in Twin Falls County; however, over the past 11 years of sampling, some wells were dropped from the project due to various reasons such as a change in well ownership or due to an owner's request. The NO_3-N summary in this report includes only the 64 wells that have been sampled consistently every year from 1998 through 2008.

Results of ground water sampling in the project area suggested an average yearly mean NO_3-N value of 4.18 mg/L and an average yearly median (50th percentile) NO_3-N value of 4.19 mg/L for the 1998 through 2008 time period. The yearly mean concentrations ranged from 3.82 to 4.9 mg/L (Tables 1 and 2). The yearly median concentration ranged from 3.7 to 5.0 mg/L. In general, the mean and median values have been relatively consistent during the period of this study; however, the mean and median concentration in 2008 are lower than those in 1998 (Tables 1 and 2 Figure 3). The maximum value ranged from 8.4 mg/L in 2003 to 15 mg/L in 2007 (Tables 1 and 2 and Figure 3).

In 1998, 26 wells or 40.6% of the wells tested had NO_3-N concentrations between 5 and 10 mg/L, which is considered to be elevated. In 2008, the number of wells with NO3-N concentrations between 5 and 10 mg/L decreased by eight wells or 12.5%. Throughout the sampling period, a few wells have had concentrations that were close to or above the EPA MCL for NO_3-N of 10mg/L. Well 7803601 exceeded the MCL for NO_3-N two of the 11 years of sampling, 2000 and 2007, while well 7804301 exceeded the MCL once during the 11 years of sampling in 2006. Wells 7803601 and 7804301 are located west of Castleford and southwest of Buhl, respectively.

In 2008, zero wells had NO_3-N concentrations that exceeded the EPA MCL for drinking water of 10mg/L (Figure 4). Detections above the MCL of 10 mg/L are of concern due to the potential health risks associated with drinking ground water high in nitrate. The highest concentration detected in 2008 was 9.4 mg/L, which was 5.6 mg/L less than the concentration in 2007.

Table 1. Statistical summary of nitrate detections in ground water from 64 domestic wells tested from 1998 through 2003.

Descriptive Statistics	1998 (64 Wells)	1999 (64 Wells)	2000 (64 Wells)	2001 (64 Wells)	2002 (64 Wells)	2003 (64 Wells)
< Laboratory Detection Limit (LDL)	0 (0.0%)	2 (3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
LDL - < 2.0 mg/L	11 (17.2%)	6 (9.5%)	9 (14.1%)	12 (18.7%)	13 (20.3%)	13 (20.3%)
2.0 - < 5.0 mg/L	27 (42.2%)	24 (37.5%)	24 (37.5%)	28 (43.8%)	34 (53.1%)	35 (54.7%)
5.0 - <10.0 mg/L	26 (40.6%)	32 (50.0%)	30 (46.9%)	24 (37.5%)	17 (26.6%)	16 (25.0%)
10.0 mg/L or greater	0 (0.0%)	0 (0.0%)	1 (1.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Mean Value	4.3	4.9	4.5	4.3	3.8	3.8
Median Value	4.4	5.0	4.8	4.3	3.8	4.0
Maximum Value	9.6	9.8	10.5	8.9	8.9	8.4

Table 2. Statistical summary of nitrate detections in ground water from 64 domestic wells tested from 2004 through 2008.

Descriptive Statistics	2004 (64 Wells)	2005 (64 Wells)	2006 (64 Wells)	2007 (64 Wells)	2008 (64 Wells)
< Laboratory Detection Limit (LDL)	0 (0.0%)	1 (1.5%)	0 (0.0%)	1 (1.5%)	0 (0.0%)
LDL - < 2.0 mg/L	15 (23.4%)	11(17.2%)	10 (15.6%)	15 (23.4%)	14 (21.9%)
2.0 - < 5.0 mg/L	29 (45.3%)	38 (59.4%)	28 (43.8%)	30 (46.9%)	32 (50.0%)
5.0 - <10.0 mg/L	20 (31.3%)	14 (21.9%)	25 (39.1%)	17 (26.6%)	18 (28.1%)
10.0 mg/L or greater	0 (0.0%)	0 (0.0%)	1 (1.5%)	1 (1.5%)	0 (0.0%)
Mean Value	3.9	3.9	4.5	3.9	3.9
Median Value	3.8	3.8	4.5	3.7	3.7
Maximum Value	8.5	8.3	14	15	9.4

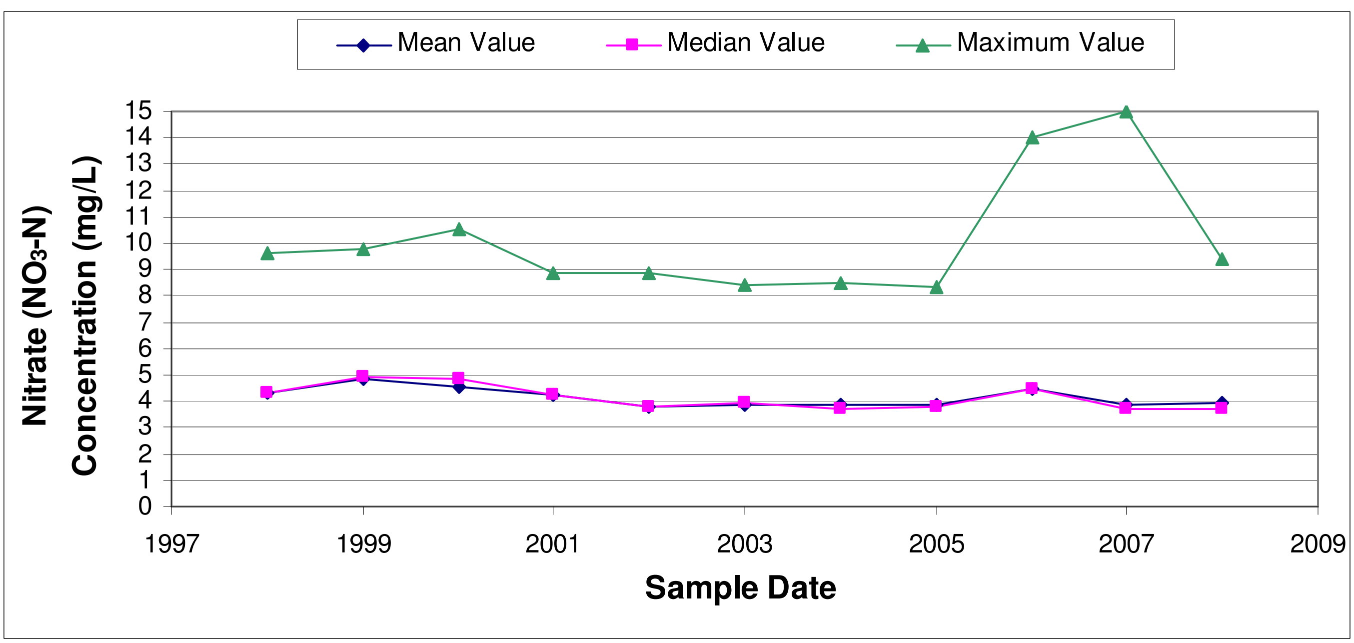

Figure 3. Time series plot of mean, median and maximum nitrate as nitrogen (NO_3-N) values for the 64 consistently sampled wells from 1998 through 2008.

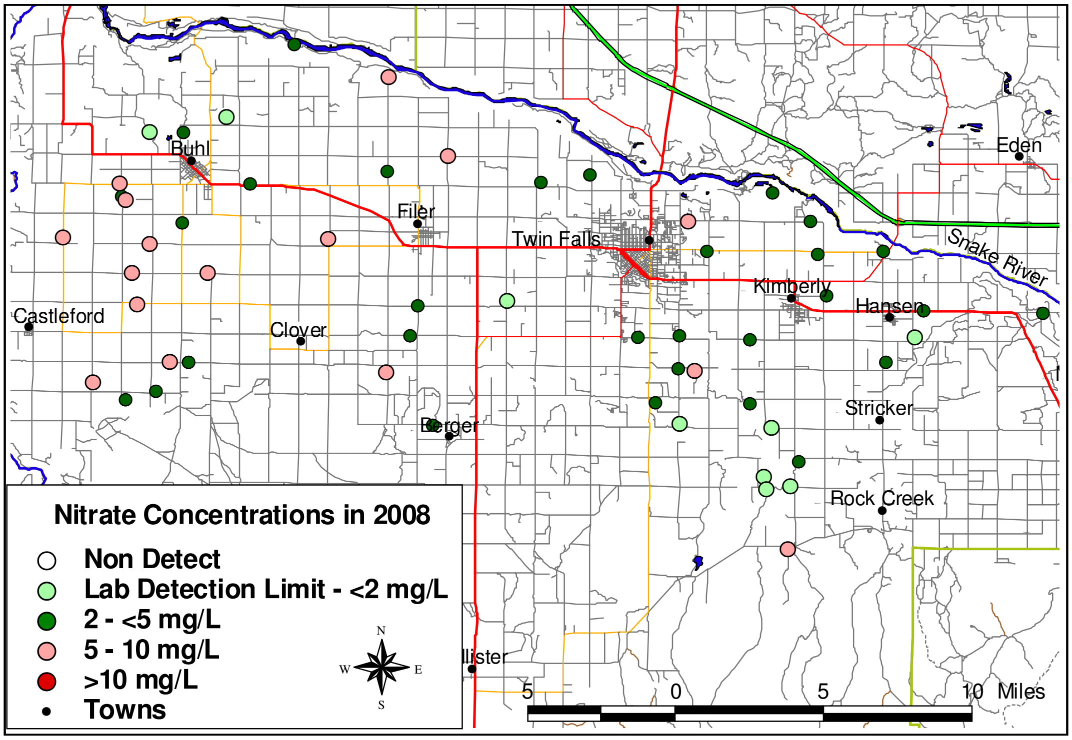

Figure 4. Nitrate Concentrations from 2008 for the 64 wells samples consistently throughout the 11 years.

Nitrogen Isotope

Overview

The ratio of the common nitrogen isotope ^{14}N to its less abundant counterpart ^{15}N (denoted $\delta^{15}N$) can be useful in determining sources of nitrate. Common sources of nitrate in ground water are from applied commercial fertilizers, animal or human waste, precipitation, residues from legume crops, and other organic nitrogen sources within the soil. Each of these nitrogen source categories may have a distinguishable nitrogen isotopic signature. Figure 5 illustrates ranges of $\delta^{15}N$ determined through numerous research studies. Typical $\delta^{15}N$ ranges for fertilizer and waste are –5 per mil ($^{0}/_{00}$) to $+5^{0}/_{00}$ and greater than $10^{0}/_{00}$, respectively. Numbers between $5^{0}/_{00}$ and $10^{0}/_{00}$ generally are believed to indicate an organic or mixed source. (Kendall and McDonnell, 1998).

The use of nitrogen isotopes as the sole means to determine nitrate source should be done with great care. $\delta^{15}N$ values of fertilizer and animal waste in ground water can be complicated by several reactions (e.g., ammonia volatilization, nitrification, denitrification, ion exchange, and plant uptake) that can significantly modify the $\delta^{15}N$ values (Kendall and McDonnel, 1998). Furthermore, mixing of sources along shallow flowpaths makes determination of sources and extent of denitrification very difficult (Kendall and McDonnell, 1998).

Findings

From 2001 through 2005, ISDA Water Program staff

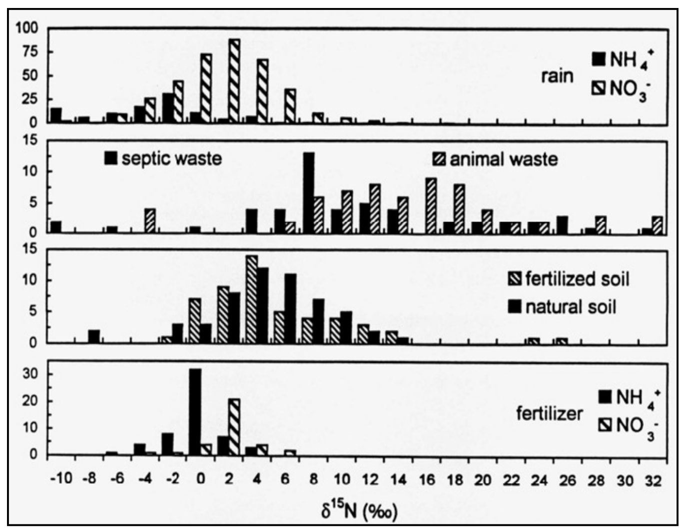

Figure 5. Ranges of $\delta^{15}N$ found in the hydrosphere based on a number of nitrogen isotope studies (after Kendall and McDonnell, 1998).

conducted $\delta^{15}N$ testing on a subset of wells as a possible indicator of source(s) of nitrate in the ground water. Wells chosen for $\delta^{15}N$ testing had elevated NO_3-N concentrations in previous monitoring efforts. Isotope results from 2001 through 2003 have been summarized in a 2004 report by Holloway et al. The report can be found on ISDA's website at http://www.agri.idaho.gov/Categories/Environment/water/gwReports.php. Only 2004 and 2005 results are presented in this report.

Twenty-six wells were tested in 2004 and 23 wells were tested in 2005. The samples were sent to the Idaho Stable Isotopes Laboratory in the Department of Forest

Table 3. $\delta^{15}N$ Results for Twin Falls County Regional Project.

Well ID	2004		2005	
	NO_3 (mg/L)	$\delta^{15}N$ (‰)	NO_3 (mg/L)	$\delta^{15}N$ (‰)
7800201	6.5	…	6	8.05
7800801	5.1	**4.72**	4.8	7.13
7800901	5.6	7.44	4	9.72
7801201	5	9.53	6.5	9.7
7801601	11	8.23	9.8	7.9
7801701	6.3	5.54	7.2	**4.48**
7802301	4.9	**4.03**	5.1	…
7802901	6.6	6.12	7.3	6.2
7803001	5.1	**4.93**	4.6	6.27
7803201	5.9	5.60	6.2	7.59
7803601	8.4	**4.97**	0	7.96
7803701	5.3	6.43	6.1	7.90
7803901	6.3	5.59	6.4	8.27
7804201	4.1	6.45	4.7	…
7804301	7.7	7.91	6.8	8.41
7804601	4.6	7.94	...	…
7804701	5	5.80	4.8	8.08
7805001	4.7	6.63	4.8	…
7805101	8.2	7.06	7.9	9.89
7805201	4.6	5.74	3.7	…
7805401	5.8	5.70	5.6	8.52
7805501	12	9.35	11	8.98
7805601	6.9	8.11	8.3	**10.57**
7805701	8.5	8.21	6.8	**11.68**
7805801	7	…	4.6	**11.31**
7805901	5.4	5.66	4.9	8.03
7806201	7	7.11	7.2	7.64
7806601	3.5	7.86	3.5	…
7807401	5.8	…	4.1	8.50

...No sample taken

Resources, College of Natural Resources at the University of Idaho. Table 3 shows the $\delta^{15}N$ results along with the NO_3-N concentrations from 2004 and 2005. Results of the $\delta^{15}N$ testing returned values ranging from 4.03‰ to 11.68‰ (Table 3).

In 2004, four wells had isotopic signatures that were consistent with an inorganic nitrogen (commercial fertilizer) source. The remainder of the samples had isotopic signatures consistent with a mixed or organic source.

In 2005, three wells had isotopic signatures over 10‰ , which is consistent with a waste (animal or human) source of nitrogen. Only one well had a signature consistent with an inorganic nitrogen (commercial fertilizer) source. The remainder of the wells had signatures consistent with a mixed or organic source.

Reactions that can complicate $\delta^{15}N$ values in ground water, such as ammonia volatilization, nitrification, denitrification, ion exchange, and plant uptake, were not investigated as part of this study. The values consistent with inorganic nitrogen (commercial fertilizer) or waste (animal or human) could be affected by these processes.

Pesticides

In 1998, 75 wells were sampled for pesticides (Table 4). Analysis of samples detected the presence of the following pesticides in order of most to least frequently detected: atrazine, dacthal (DCPA), 2,4-D, and diazinon. There were a total of 22 pesticide detections in 19 wells in 1998. All of the detections were below any health standard set by the EPA or State of Idaho.

In 1999, 21 wells were sampled for follow-up of pesticide detections in 1998 (Table 5). There were six

Table 4. 1998 Pesticide Results for Twin Falls County Volcanic and Sedimentary Aquifer Regional Project.

Pesticide Detected	Number of Detections	Range (µg/L)	Mean Value of Detects (µg/L)	Median Value of Detects (µg/L)	Health Standard (µg/L)
2,4-D	3	0.1 - 0.55	0.28	0.3	70 (HAL)[1]
Atrazine	13	0.01 - 0.23	0.07	0.06	3 (MCL)[2]
Dacthal (DCPA)	4	0.05 - 0.3	0.19	0.2	70 (HAL)
Diazinon	1	0.41	—	—	0.6 (HAL)

[1]HAL - EPA Lifetime Health Advisory
[2]MCL - EPA Maximum Contaminant Level

Table 5. 1999 Pesticide Results for Twin Falls County Volcanic and Sedimentary Aquifer Regional Project.

Pesticide Detected	Number of Detections	Range (µg/L)	Mean Value of Detections (µg/L)	Median Value of Detections (µg/L)	Health Standard (µg/L)
Atrazine	5	0.03 - 0.08	0.048	0.04	3 (MCL)[1]
Dacthal (DCPA)	1	0.13	—	—	70 (HAL)[2]

[1]MCL - EPA Maximum Contaminant Level
[2]HAL - EPA Lifetime Health Advisory

pesticide detections in six wells. All of the detections were below any health standard set by the EPA or State of Idaho.

In 2000, 74 wells were sampled again for pesticides. Table 6 shows the pesticides detected and the number of pesticide detections. Atrazine was most commonly detected with 19 detections, followed by dacthal with six detections. Picloram and propazine were each detected once. All of the detections were below any health standard set by the EPA or State of Idaho.

In 2001, pesticide sampling of 32 wells was completed as follow-up to detections in 2000. Table 7 shows that five pesticides were detected in 2001. Desethyl atrazine, a breakdown product of atrazine, was most commonly found with detections in 16 wells. The next most commonly detected pesticide was atrazine with nine detections. Bromacil, 2,4-D, and dacthal were each detected once. All of the detections were below any health standard set by the EPA or State of Idaho.

In 2002, 74 wells were sampled for pesticides. Three pesticides were detected a total of 26 times. Desethyl atrazine, a breakdown product of atrazine, was most commonly found with detections in 16 wells (Table 8). The next most commonly detected pesticide was atrazine with nine detections. The third least commonly

Table 6. 2000 Pesticide Results for Twin Falls County Volcanic and Sedimentary Aquifer Regional Project.

Pesticide Detected	Number of Detections	Range (µg/L)	Mean Value of Detections (µg/L)	Median Value of Detections (µg/L)	Health Standard (µg/L)
Atrazine	19	0.03 - 0.19	0.059	0.05	3 (MCL)[1]
Dacthal	6	0.09 - 17	5.77	1.67	70 (HAL)[2]
Picloram	1	0.27	—	—	500 (MCL)
Propazine	1	0.02	—	—	10 (HAL)

[1]MCL - EPA Maximum Contaminant Level
[2]HAL - EPA Lifetime Health Advisory

Table 7. 2001 Pesticide Results for Twin Falls County Volcanic and Sedimentary Aquifer Regional Project.

Pesticide Detected	Number of Detections	Range (µg/L)	Mean Value of Detections (µg/L)	Median Value of Detections (µg/L)	Health Standard (µg/L)
2, 4-D	1	0.84	—	—	70 (HAL)[1]
Atrazine	9	0.03 - 0.16	0.071	0.05	3 (MCL)[2]
Bromacil	1	0.15	—	—	90 (HAL)
Dacthal	1	0.17	—	—	70 (HAL)
Desethyl Atrazine	16	0.03 - 0.31	0.097	0.07	….[3]

[1]HAL - EPA Lifetime Health Advisory
[2]MCL - EPA Maximum Contaminant Level
[3]Breakdown product of atrazine, MCL for atrazine (3 µg/L) is used as the health standard.

Table 8. 2002 Pesticide Results for Twin Falls County Volcanic and Sedimentary Aquifer Regional Project.

Pesticide Detected	Number of Detections	Range (µg/L)	Mean Value of Detections (µg/L)	Median Value of Detections (µg/L)	Health Standard (µg/L)
Atrazine	9	0.03 - 0.16	0.071	0.05	3 (MCL)[1]
Dacthal	1	0.18	—	—	70 (HAL)[2]
Desethyl Atrazine	16	0.03 - 0.27	0.097	0.07	….[3]

[1]MCL - EPA Maximum Contaminant Level
[2]HAL - EPA Lifetime Health Advisory
[3]Breakdown product of atrazine, MCL for atrazine (3 µg/L) is used as the health standard.

detected pesticide and only other pesticide detected was dacthal with one detection. All of the detections were below any health standard set by the EPA or State of Idaho.

Table 9 shows the results from the pesticide sampling from the 73 wells tested in 2006. Eight different pesticides were detected. Thirty-five or 48% of the 73 wells sampled had pesticide detections. The most commonly detected pesticide was desethyl atrazine, a breakdown product of atrazine, with 29 detections, followed by atrazine with nine detections and dacthal and 2,4-D, each with two detections. The following were each detected once: bromacil, diazinon,

Table 9. 2006 Pesticide Results for Twin Falls County Volcanic and Sedimentary Aquifer Regional Project.

Pesticide Detected	Number of Detections	Range (µg/L)	Mean Value of Detections (µg/L)	Median Value of Detections (µg/L)	Health Standard (µg/L)
2, 4-D	2	0.21 - 0.46	0.34	—	70 (MCL)[1]
Atrazine	9	0.03 - 0.15	0.06	0.04	3 (MCL)
Bentazon	1	0.23	—	—	200 (HAL)[2]
Bromacil	1	0.56	—	—	90 (HAL)
Dacthal	2	0.09 - 0.28	0.19	—	70 (HAL)
Desethyl Atrazine	29	0.03 - 0.22	0.07	0.05	…[3]
Diazinon	1	0.05	—	—	0.6 (HAL)
Hexazinone	1	0.06	—	—	400 (HAL)
MCPP	1	0.21	—	—	280*[4]

[1]MCL - EPA Maximum Contaminant Level
[2]HAL - EPA Lifetime Health Advisory
[3]Breakdown product of atrazine, MCL for atrazine (3 µg/L) is used as the health standard.
[4*] This is a calculated reference point using a chronic Reference Dose (cRfD) of 0.04 mg/kg/day.

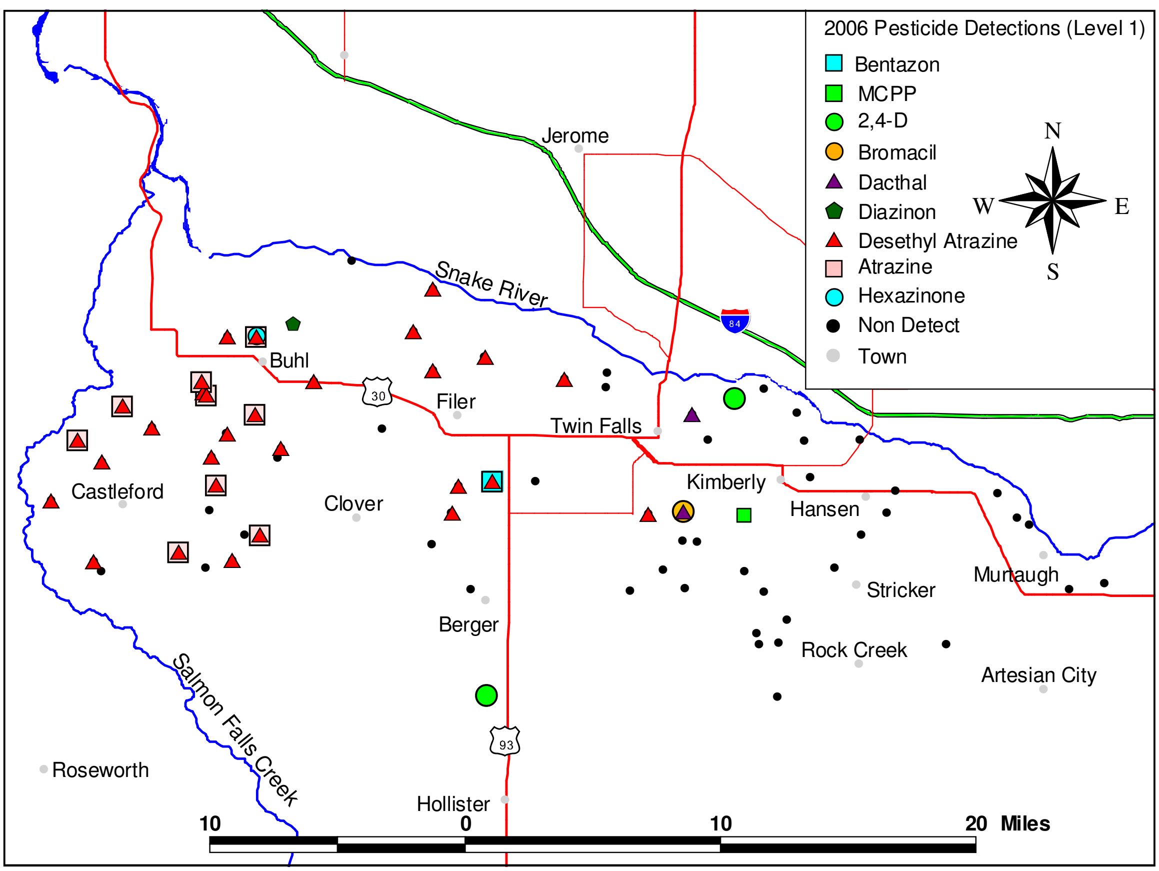

Figure 5. Locations of wells with pesticide detections in 2006. All detections are Level 1 (low level) detections.

hexazinone and MCPP (Figure 5). All of the detections were below any health standard set by the EPA or State of Idaho.

Pesticide sampling was not completed for this project in 2003, 2004, or 2005. All active wells in the Twin Falls County Volcanic and Sedimentary Aquifer Regional Project will be sampled for pesticides during the summer of 2009.

Conclusions

Ground water within the project area has been degraded by nitrate and pesticides. However, there has been a slight improvement with the decrease in yearly mean and median nitrate values from 1998 to 2008.

In 1998, 40.6% of the wells had nitrate concentrations of 5 mg/L or higher compared to 28.1% in 2008; a decrease of 12.5%. Although the number of wells with a concentration of 5 mg/L or higher decreased, 78.2% of the wells in 2008 had nitrate concentrations above the level that is considered background (2 mg/L), which signifies some impact.

Sampling results indicate that nitrate and pesticide impacts are widespread. However, based on 2008 data, there appears to be a concentrated area of elevated nitrate southwest of Buhl and northeast of Castleford.

Pesticide detections have been low since the monitoring began; however, there have been many detections each year and several wells with detections of more than one pesticide. Health risks associated with consuming low level concentrations of more than one pesticide is unknown.

Ten different pesticides were detected throughout the 1998 through 2008 time period. Those detected include: 2,4-D, atrazine, bromacil, dacthal (DCPA), desethyl atrazine, diazinon, hexazinone, MCPP, picloram, and propazine. The most commonly detected pesticides were atrazine and desethyl atrazine, a breakdown product of atrazine. All detections have been low level concentrations and below health standards set by the EPA.

There are many potential sources for nitrate contamination of ground water. Those potential sources include: atmospheric nitrogen, legume plowdown, soil organic matter, septic tanks, animal waste, and commercial fertilizer. Since the majority of the project area is considered a rural area with agriculture as a dominant land use, septic tanks, animal waste and general agricultural practices are likely contributors to nitrate and pesticide detections in the ground water.

Recommendations

The ISDA recommends that measures to reduce nitrate and pesticide impacts on ground water be evaluated and implemented. Some suggestions include:

- Growers and agrichemical professionals conduct nutrient, pesticide, and irrigation water management evaluations.
- Producers follow the Idaho Agricultural Pollution Abatement Plan and Natural Resources Conservation Service Nutrient Management Standard.
- Producers and agrichemical dealers evaluate their storage, mixing, loading, rinsing, containment, and disposal practices.
- Homeowners assess lawn and garden practices, especially near wellheads.
- Local residents assess animal waste management practices.
- State and local agencies assess impacts from private septic systems.
- Home and garden retail stores establish outreach programs to illustrate proper application and management of nutrients and pesticides.
- Responsible parties assess current pesticide application practices to non-crop areas (example: roadsides, railroad areas, etc.).

The ISDA recommends that the Balanced Rock, Snake River, and Twin Falls Soil and Water Conservation Districts lead a response process to create a plan of action to address these ground water contamination issues. Some actions that could be beneficial to ground water protection would be irrigation water management and soil sampling. The soil and water conservation districts should work with local agrichemical professionals, landowners, and agencies to implement this process and seek funding to support these efforts.

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